

High Energy Density Solid State Li-Ion Battery with Enhanced Safety, Phase I

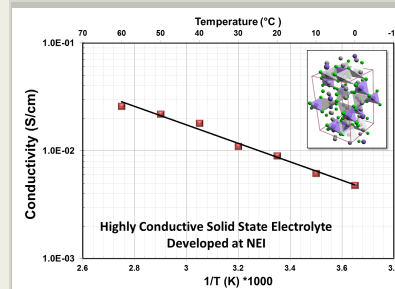
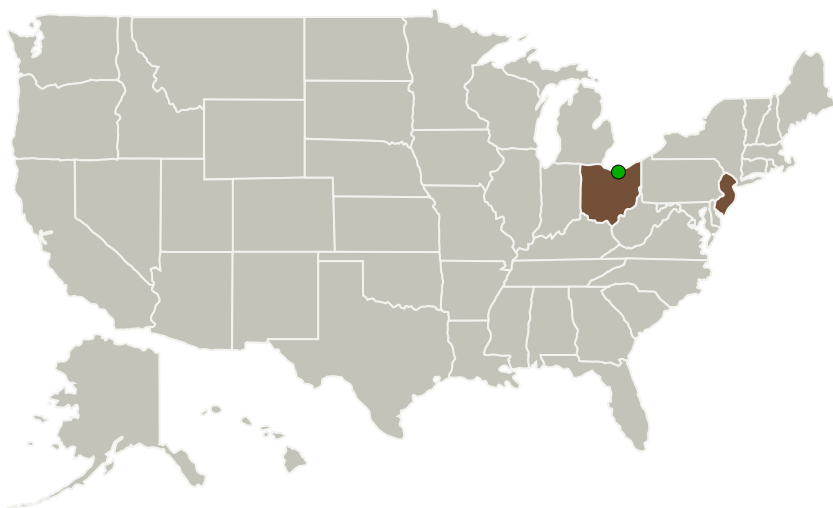
Completed Technology Project (2014 - 2014)



Project Introduction

We propose to develop an all solid state Li-ion battery which is capable of delivering high energy density, combined with high safety over a wide operating temperature range. The proposed effort builds upon an in-house developed inorganic solid electrolyte that has demonstrated high ionic conductivity at room temperature (1.5×10^{-2} S/cm). The primary objective of the Phase I program is to demonstrate that the recently invented solid electrolyte can be formulated into a useable form in a practical Li-ion battery, and that traditional challenges associated with the use of a solid electrolyte can be overcome. A key innovation is the use of a unique composite morphology for the solid electrolyte, wherein passive components, such as the binder and separator, are replaced by an active conductive electrolyte network. The proposed new solid electrolyte will fully eliminate the flammability issues of conventional Li-ion batteries, thereby leading to a safer device with high thermal and mechanical stability. The target energy density for the proposed solid electrolyte based Li-ion cell at the cell level are: greater than 500Wh/kg (gravimetric) and 2700 Wh/l (volumetric), while maintaining 80% of initial capacity after 500 cycles under full depth of discharge. The Phase I effort entails fabrication of the proposed composite solid electrolyte, and cell level testing with a suitably modified cathode and anode. A successful Phase I program will lay the foundation for prototype cell and cell-pack demonstration in Phase II, where Li-ion cells will be designed, assembled, and tested to meet the requirements of NASA for safety, cycle life and energy density. Prototype cells will be delivered to NASA at the end of the Phase II program.

Primary U.S. Work Locations and Key Partners



High Energy Density Solid State Li-ion Battery with Enhanced Safety Project Image

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Organizations Performing Work	Role	Type	Location
NEI Corporation	Lead Organization	Industry Small Disadvantaged Business (SDB)	Piscataway, New Jersey
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

New Jersey	Ohio
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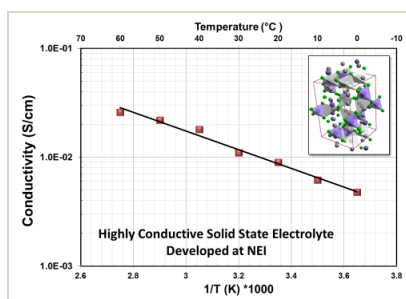
Project Transitions

**June 2014:** Project Start**December 2014:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137470>)

Images



Project Image

High Energy Density Solid State Li-ion Battery with Enhanced Safety Project Image
(<https://techport.nasa.gov/image/129370>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

NEI Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

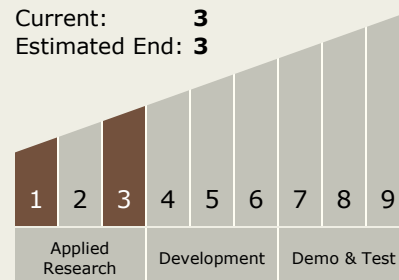
Carlos Torrez

Principal Investigator:

Nader Hagh

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.2 Energy Storage
 - └ TX03.2.1 Electrochemical: Batteries

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System